Ontario

Apprenticeship
In-school Curriculum Standard

Pool & Spa/Hot Tub Service Technician
and
Pool & Spa/Hot Tub Installer

Level 1 – Common Core

237T & 237S

Ministry of Training, Colleges and Universities

Apprenticeship
In-school Curriculum Standard

Pool & Spa/Hot Tub Service Technician and Pool & Spa/Hot Tub Installer

Level 1 – Common Core

237T & 237S

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TABLE OF CONTENTS

Introduction 5

Program Summary of Reportable Subjects 6

S1101.0 Applied Trade Safety Practices 7
S1101.1 Identify safety regulations that are applicable to Pool & Spa/Hot Tub Service Technician or Installer 9
S1101.2 Identify safety procedures and practices as required on the worksite 9
S1101.3 Describe safety procedures when handling and mixing chemicals, paints, and solvents 10
S1101.4 Describe use of required protective clothing and gear 10
S1101.5 Describe safety procedures when operating or working around power tools and heavy machinery 10

S1102.0 Occupational Practices 11
S1102.1 Demonstrate procedures for completing site evaluations 13
S1102.2 Describe use and maintenance of trade tools 14
S1102.3 Describe good housekeeping habits 14
S1102.4 Identify general troubleshooting techniques 15
S1102.5 Describe commissioning/decommissioning procedures 15
S1102.6 Describe preparation procedures for performing servicing or installation tasks 16
S1102.7 Describe basic leak detection principles 17

S1103.0 Product Identification 18
S1103.1 Identify industry terminology and standards 19
S1103.2 Identify various manufacturers' equipment and components 19

S1104.0 Documentation 21
S1104.1 Interpret pertinent written documentation 22
S1104.2 Demonstrate procedures for the completion of forms and documentation 22

S1105.0 Customer Service 24
S1105.1 Describe characteristics of a personal professional image 25
S1105.2 Describe customer service best practices 25
S1105.3 Describe listening and conversational skills 25
S1105.4 Demonstrate effective writing skills 26

S1106.0 Legislation and Regulations 27
S1106.1 Identify regulations that govern pool and pa/hot tub operations 28
S1106.2 Identify regulations that govern pool and spa/hot tube installing, servicing, and maintenance 29
S1106.3 Identify regulations for working in the pool and spa/hot tub industry 29
S1106.4 Describe factors of risk management 29

S1107 Trade Calculations 30
S1107.1 Convert dimensions and quantities between Metric and Imperial 32
S1107.2 Develop sketches from linear dimensions 32
S1107.3 Calculate perimeters, areas and volumes 32
S1107.4 Solve problems using ratios and proportions 33
S1107.5 Calculate dimensions using the Pythagorean theorem formulae 33
S1107.6 Calculate chemical treatment/adjustments 33
S1107.7 Calculate water volumes. 33
S1107.8 Calculate flow rates and velocities 33
S1107.9 Calculate water temperature adjustments 33

S1108.0 Water Chemistry 34
S1108.1 Identify pertinent safety procedures when working with chemicals for water balancing and sanitation 36
S1108.2 Describe elements and features of water balancing 36
S1108.3 Describe elements and features of water sanitation 37
S1108.4 Describe water chemistry testing procedures 37
S1108.5 Identify chemicals used to balance and clean water 38
S1108.6 Perform calculations for balancing and sanitizing water 38

S1109.0 Plumbing 39
S1109.1 Identify pertinent safety regulations and procedures when performing plumbing installation or maintenance 41
S1109.2 Describe functions and operations of circulation components 41
S1109.3 Describe functions and operations of pumps and motors 43
S1109.4 Describe functions and operations of filtration systems components 44
S1109.5 Describe functions and operations of the heating system and components 45
S1109.6 Describe functions and operations of water hydraulics 46
S1109.7 Describe application and function of piping and fittings 46
S1109.7 Describe leak detection testing and repair techniques 47

S1110.0 Pool and Spa/Hot Tub Structures 48
S1110.1 Identify standards industry material for pools or spa/hot tub structures and components 50
S1110.2 Describe types of pool and spa/hot tub shell structures 50
S1110.3 Identify types and application techniques of interior finishes 51
S1110.4 Identify common structural or surface problems that can occur with pools and spa/hot tubs 52
S1110.5 Identify basic repair techniques for structures or surfaces of pools and spa/hot tubs 52

S1111.0 Electrical Systems 53
S1111.1 Identify pertinent legislation and regulations when working with electrical systems 55
S1111.2 Describe electrical theory and terminology 55
S1111.3 Perform calculations for electrical systems 56
S1111.4 Identify basic electrical components and circuits 56
S1111.5 Interpret basic electrical schematics 56
S1111.6 Describe functions and operations of electrical motors and components 56
S1111.7 Demonstrate basic electrical testing procedures 57

SS1112.0 General Construction And Maintenance Methods 58
SS1112.1 Identify pertinent legislation and regulations when performing general construction and maintenance work 60
SS1112.2 Identify types and construction methods for concrete pool and spa/hot tubs 61
SS1112.3 Identify types and construction methods for in-ground and on-ground vinyl pools 62
SS1112.4 Identify types and construction methods for above-ground vinyl pools 62
SS1112.5 Describe functions and operations of maintenance equipment 62
SS1112.6 Describe procedures for performing routine and seasonal maintenance 63
SS1112.7 Describe functions and operations of pool covers 63
SS1112.8 Describe functions and operations of automatic pool cleaning systems 64
S1112.09 Describe functions and features of decking equipment 64

Glossary of Terms **65**

Introduction

This curriculum standard for the Pool and Spa/Hot Tub Trades Level 1, Common core is based upon the on-the-job performance objectives, located in the industry-approved training standard.

The curriculum is organized into 12 reportable subjects. The Program Summary of Reportable Subjects chart summarizes the training hours for each reportable subject. The curriculum identifies only the learning that takes place off-the-job.

The in-school program focuses primarily on the theoretical knowledge and the essential skills required to support the performance objectives of the Apprenticeship Training Standards. Employers/Sponsors are expected to extend the apprentice's knowledge and skills through practical training on the work site.

Regular evaluations of the apprentice's knowledge and skills are conducted throughout training to ensure that all apprentices have achieved the learning outcomes identified in the curriculum standard.

It is not the intent of the in-school curriculum to perfect on-the-job skills. The practical portion of the in-school program is used to reinforce theoretical knowledge. Skill training is provided on the job.

Program Summary of Reportable Subjects - Level 1 – Common Core

Number	Reportable Subjects	Hours Theory	Hours Practical	Hours Total
S1101	Applied Trade Safety Practices	9	3	12
S1102	Occupational Practices	24	6	30
S1103	Product Identification	6	3	9
S1104	Documentation	12	3	15
S1105	Customer Service	3	3	6
S1106	Legislation and Regulations	15	0	15
S1107	Trade Calculations	9	12	21
S1108	Water Chemistry	27	3	30
S1109	Plumbing	24	12	36
S1110	Pool and Spa/Hot Tub Structures	15	3	18
S1111	Electrical Systems	15	9	24
S1112	General Construction and Maintenance Techniques	21	3	24
	Total	180	60	240

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer

Level 1 Common Core

Number: **S1101.0**

Reportable Subject: **APPLIED TRADE SAFETY PRACTICES**

Duration: Total 12 hours Theory 9 hours Practical 3 hours

Prerequisites: Grade 12

Content:

S1101.1 Identify safety regulations that are applicable to Pool & Spa / Hot Tub Service Technician and Pool & Spa / Hot Tub Installer. **1/0 Hrs**

S1101.2 Identify safety procedures and practices as required on the worksite. **2/0 Hrs**

S1101.3 Describe safety procedures when handling and mixing chemicals, paints and solvents. **2/1 Hrs**

S1101.4 Describe use of required protective clothing and gear. **2/1 Hrs**

S1101.5 Describe safety procedures when operating working around power tools or heavy machinery. **2/1 Hrs**

Evaluation & Testing:

Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
75%	25%	100%

Instructional and Delivery Strategies:
- Lecture
- Classroom workshops
- Video
- Computer Based Training
- E-Learning

Reference Materials:
- WHMIS Handbook
- Occupational Health and Safety Act

S1101.0 Applied Trade Safety Practices

Duration: Total 12 hours Theory 9 hours Practical 3 hours

Cross Reference to Training Standards: 237S 1.0 > 8.0; 237T 1.0 > 6.0

GENERAL LEARNING OUTCOMES

Upon successful completion, the apprentice is able to identify and describe practices to maintain a safe worksite for self and others that complies with current government regulations.

LEARNING OUTCOMES AND CONTENT

S1101.1 Identify safety regulations that are applicable to both Pool & Spa/Hot Tub Service Technician and Pool & Spa / Hot Tub Installer. 1/0 hrs

Identify pertinent safety legislation including:

- Occupational Health and Safety Act
- Workplace Hazardous Materials Information System
- Transportation of Dangerous Good Regulations
- Workers Safety and Insurance Board
- Technical Standards and Safety Authority
- Electrical Safety Authority

S1101.2 Identify safety procedures and practices as required on the worksite. 2/0 hrs

Identify safe working procedures including:

- lifting techniques
- working conditions
- handling of tools and equipment
- excavations
- barricades and guards
- fall-rest protection
- safety barriers
- good housekeeping

LEARNING CONTENT:

S1101.3 Describe safety procedures when handling and mixing chemicals, paints, and solvents. 2/1 hrs

Identify safety procedures when handling chemicals, paints, and solvents including:

- chemical spills
- ventilation

S1101.4 Describe use of required protective clothing and gear. 2/1 hrs

Describe use of required protective clothing and gear including:

- eye
- ear
- hand
- feet
- head
- respiratory protectors

S1101.5 Describe safety procedures when operating or working around power tools and heavy machinery. 2/1 hrs

Identify safety procedures for working around heavy machinery including:

- pertinent legislation and regulations
- skid-steer loaders
- backhoes and excavators
- trucks

Identify safety procedures for using powered tools including:

- concrete saws
- post-hole diggers
- chainsaws

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer

Level 1 Common Core

Number: **S1102.0**

Reportable Subject: **OCCUPATIONAL PRACTICES**

Duration: Total 30 hours Theory 24 hours Practical 6 hours

Prerequisites: Grade 12

Content:

S1102.1 Demonstrate procedures for completing site evaluations. **(2/1 hrs)**

S1102.2 Describe use and maintenance of trade tools. **(1/1 hrs)**

S1102.3 Describe good housekeeping habits. **(1/1 hrs)**

S1102.4 Identify general troubleshooting techniques. **(6/1 hrs)**

S1102.5 Describe commissioning/de-commissioning procedures. **(4/0 hrs)**

S1102.6 Describe preparation procedures for performing servicing or installation tasks. **(4/1 hrs)**

S1102.7 Describe basic leak detection principles. **(6/1 hrs)**

Evaluation & Testing:

Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
80%	20%	100%

Instructional and Delivery Strategies:
- Lecture
- Classroom workshops
- Video
- Computer Based Training
- E-Learning

Reference Materials:
- Manufacturers' Technical Manuals
- Ministry of Transportation Legislation
- APSP Basic Pool & Spa/Hot Tub Technology 3rd Edition
- APSP Builders Reference Manual

S1102.0 Occupational Practices

Duration: Total 30 hours Theory 24 hours Practical 6 hours

Cross Reference to Training Standards:
Service Technician: 2.01-2.10, 3.01-3.10, 4.01-4.08, 5.01-5.10, 6.01-6.11, 7.01-7.09, 8.01-8.09
Installer: 2.01, 2.02, 2.04-2.07, 3.01-3.16, 4.01-4.13, 5.01-5.19, 6.01-6.09

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to plan and prepare for the servicing, maintenance, and installation of a pool or spa/hot tub.

CURRICULUM OUTCOMES:

S1102.1 Demonstrate procedures for completing site evaluations. 2/1 Hrs

Describe procedures for planning a site evaluation including:
- notes
- observations
- equipment location and identification
- utilities locations

Describe evaluation of site elements including:
- dangerous or unsafe conditions
- general site conditions

Demonstrate completion of site evaluation plans and sketches including:
- rough drawings
- notes

Demonstrate completion of a site plan/inspection or evaluation checklist.

LEARNING CONTENT:

S1102.2 Describe use and maintenance of trade tools. (1/1 hrs)

Describe the safe operation of applicable trade tools including:

- hand tools
- electric power tools
- specialty tools
- gas-powered tools and equipment

Describe maintenance procedures for trade tools including:

- general upkeep
- routine maintenance
- manufacturers' requirements

Develop checklists for tool repair and maintenance including:

- logbooks
- records
- warranty registrations

S1102.3 Describe good housekeeping habits. (1/1 hrs)

Describe general housekeeping practices for work site including:

- daily practices
- safety issues
- vehicle inspections
- worksite housekeeping

Describe techniques for dismantling and restoring worksite environment including:

- landscaping
- fences
- decking
- interlocking stone
- groundwork

LEARNING CONTENT:

S1102.4 Identify general troubleshooting techniques. (6/1 hrs)

Describe required tools and methods for troubleshooting using:

- flow charts
- schematic drawings
- ladder diagrams
- manufacturers' specifications

S1102.5 Describe commissioning/de-commissioning procedures. (4/0 hrs)

Identify pertinent legislation that is pertinent to commissioning/de-commissioning pools and spa/hot tubs.

Describe commissioning/decommissioning procedures for electrical systems including:

- lock out procedures
- shut down procedures

Describe commissioning/decommissioning procedures for circulation systems including:

- pool filling
- shut down sequences
- equipment preparation/protection
- structure preparation/protection
- electrical controls

Describe a commissioning/decommissioning checklist for:

- equipment and components
- circulating systems
- structural elements
- electrical systems
- storage/protection procedures

LEARNING CONTENT:

S1102.6 Demonstrate preparation procedures for servicing or installation tasks. (4/1 hrs)

Identify safe loading practices when handling:

- chemicals
- materials
- equipment
- tools

Develop checklists to plan and perform assigned tasks including:

- material requirement
- tools
- documentation
- manpower

Describe general preparation checklists or inspections for:

- workshop
- utilities
- vehicles
- equipment and tools
- worksite

Describe Ministry of Transportation approved vehicle pre-operational checking procedures:

- circle check
- log book completion
- vehicle maintenance log book

LEARNING CONTENT:

S1102.7 Describe basic leak detection principles. (6/1 hrs)

Identify leak problems that can occur in pools and spa/hot tub structures including:

- vinyl liners

Describe leak problems that can occur in pool circulating systems including:

- pipes
- equipment
- fittings

Describe basic methodologies for detecting leaks including:

- dye tests
- pressure testing
- electronic leak detection

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer — Level 1 Common Core

Number: **S1103.0**

Reportable Subject: **PRODUCT IDENTIFICATION**

Duration: Total 9 hours Theory 6 hours Practical 3 hours

Prerequisites: Grade 12

Content:

S1103.1 Identify industry terminology and standards. **4/0 hrs**

S1103.2 Identify various manufacturers' equipment and components. **2/3 hrs**

Evaluation & Testing:
Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
75%	25%	100%

Instructional and Delivery Strategies:
Lecture
Classroom workshops
Video
Computer Based Training
E-Learning

Reference Materials:
Manufacturers' Technical Manuals
APSP Basic Pool & Spa/Hot Tub Technology 3rd Edition
Permits
Building Codes

S1103.0 Product Identification

Duration: Total 9 hours Theory 6 hours Practical 3 hours

Cross Reference to Training Standards:
Service Technician: 2.01-2.04, 2.07, 2.08, 3.01-3.08, 4.01-4.06, 5.01-5.09, 6.01-6.10, 7.01-7.08, 8.01-8.08
Installer: 2.01, 2.02, 2.06, 3.01-3.12, 3.14, 4.01-4.09, 4.12, 5.01-5.16, 6.01, 6.02, 6.04-6.06, 6.08

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to identify and describe products, materials, and equipment used when servicing or installing pools or spa/hot tubs.

CURRICULUM OUTCOMES:

S1103.1 Identify industry terminology and standards. (4/0 hrs)

Identify industry terminology and standards including:
- construction terms
- equipment terminology
- materials terminology
- servicing and maintenance terminology
- installation terminology

S1103.2 Identify various manufacturers' equipment and components. (2/3 hrs)

Identify manufacturers' equipment and parts using:
- visual identification
- part number identification
- labels
- plates

Identify components, parts, and technical specifications using:
- catalogues
- parts books
- service manuals
- installation manuals
- databases

LEARNING CONTENT:

S1103.2 (continued)

Interpret manufacturer specifications and drawings to identify:

- parts specifications
- assembly/disassembly procedures
- servicing requirements
- warranty requirements
- excavation specifications
- pool panel layouts
- diving standards

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer

Level 1 Common Core

Number: **S1104.0**

Reportable Subject: **DOCUMENTATION**

Duration: Total 15 hours Theory 12 hours Practical 3 hours

Prerequisites: Grade 12

Content:

S1104.1 Interpret pertinent documentation. **(6/1 hrs)**

S1104.2 Demonstration procedures for the completion of forms and documentation. **(6/2 hrs)**

Evaluation & Testing:

Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
75%	25%	100%

Instructional and Delivery Strategies:

Lecture
Classroom workshops
Video
Computer Based Training
E-Learning

Reference Materials:

Sample Forms and Documents
Manufacturers' Warranty Documentation
Builder and Servicing Reference Materials
Permits
Building Codes

S1104.0 Documentation

Duration: Total 15 hours Theory 12 hours Practical 3 hours

Cross Reference to Training Standards:

Service Technician: 2.01, 2.02, 2.04-2.09, 2.11,3.01-3.09, 3.11, 4.01-4.07, 4.09, 5.01-5.09, 5.11, 6.01-6.10, 6.13, 7.01-7.08, 7.10, 8.01-8.08, 8.10

Installer: 2.01-2.04, 2.06-2.08, 3.01, 3.02, 3.05-3.12, 3.14-3.17, 4.01-4.04, 4.06-4.10, 4.12, 4.13, 4.15, 5.01-5.18, 5.20, 6.01-6.05, 6.08-6.10

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to describe procedures and processes for completing all documentation during the installation or servicing of pools and spas/hot tubs.

CURRICULUM OUTCOMES:

S1104.1 Interpret pertinent documentation. (6/1 hrs)

Interpret work documentation including:

- technical specifications
- trade manuals
- manufacturers' specifications
- customer correspondence
- warranty information
- work orders
- schedules

S1104.2 Demonstrate procedures for the completion of forms and documents. (6/2 hrs)

Describe the purpose and completion of forms including:

- invoicing
- estimating
- material usage
- customer data
- equipment inventory
- recording serial numbers
- warranties
- permits
- legislation

LEARNING CONTENT:

S1104.2 (continued)

Demonstrate completion procedures for:

- vehicle logs
- time records
- customer correspondence
- warranties
- inspection reports
- job sheets
- equipment inventory
- serial number sheets
- permits
- building codes

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer — Level 1 Common Core

Number: **S1105.0**

Reportable Subject: **CUSTOMER SERVICE**

Duration: Total 6 hours Theory 3 hours Practical 3 hours

Prerequisites: Grade 12

Content:

S1105.1 Describe characteristics of a personal professional image. **(0.5/0.5 hrs)**

S1105.2 Describe customer service best practices. **(0.5/0.5 hrs)**

S1105.3 Describe listening and conversational skills. **(1/1 hrs)**

S1105.4 Demonstrate effective writing skills. **(1/1 hrs)**

Evaluation & Testing:

Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
50%	50%	100%

Instructional and Delivery Strategies:

Lecture
Classroom workshops
Video
Computer Based Training
E-Learning

Reference Materials:

Sample Forms and Documents
Manufacturers' Warranty Documentation
Builder and Servicing Reference Materials

S1105.0 Customer Service

Duration: Total 6 hours Theory 3 hours Practical 3 hours

Cross Reference to Training Standards:
Service Technician: 2.12, 3.12, 4.10, 5.12, 6.12, 7.11, 8.11
Installer: 2.09, 3.18, 4.15, 5.21, 6.11

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to demonstrate techniques for communicating with customers and providing customer service policies.

CURRICULUM OUTCOMES:

S1105.1 Describe characteristics of a personal professional image. (0.5/0.5 hrs)

Identify characteristics of a personal image including:
- interactive skills
- personal hygiene
- dress

S1105.2 Describe customer service best practices. (0.5/0.5 hrs)

Identify elements and practices of customer service policies including:
- telephone etiquette
- handling customer complaints and queries
- standards of conduct

S1105.3 Describe listening and conversational skills. (1/1 hrs)

Describe listening and conversational skills to be used for::
- solving problems
- generating ideas
- understand customer needs and requests

LEARNING CONTENT:

S1105.4 Demonstrate effective writing skills. (1/1 hrs)

Demonstrate effective writing skills for:

- warranty forms completion
- sales slips
- customer notification and complaint forms
- work documentation

Number: **S1106.0**

Reportable Subject: **LEGISLATION AND REGULATIONS**

Duration: Total 15 hours Theory 15 hours Practical 0 hours

Prerequisites: Grade 12

Content:

S1106.1 Identify regulations that govern pool and spa/hot tub operations. **5/0 hrs**

S1106.2 Identify regulations that govern pool and spa/hot tub installations, servicing, and maintenance. **5/0 hrs**

S1106.3 Identify regulations for working in the pool and spa/hot tub industry. **3/0 hrs**

S1106.4 Describe factors of risk management. **2/0 hrs**

Evaluation & Testing:
Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
100%	0%	100%

Instructional and Delivery Strategies:
Lecture
Classroom workshops
Video
Computer Based Training
E-Learning

Reference Materials:
Manufacturers' Warranty Documentation
TSSA
ESA
Ministry of Labour

S1106.0 Legislation and Regulations

Duration: Total 15 hours Theory 15 hours Practical 0 hours

Cross Reference to Training Standards: 237S 1.0 > 8.0; 237T 1.0 > 6.0

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to identify and describe pertinent legislation and regulations pertaining to pool or spa/hot tub installations, construction, servicing, and maintenance.

CURRICULUM OUTCOMES:

S1106.1 Identify regulations that govern pool and spa/hot tub operations. (5/0 hrs)

Identify health protection legislation including:

- public health
- public protection
- health protocols

Identify environmental protection protocols including:

- water usage
- waste water disposal

Identify Building Codes pertinent to pool and spa/hot tub installation, construction, servicing and maintaining including:

- National
- Provincial
- Municipal

Identify pertinent Safety Legislation for pool and spa/hot tub installation, construction, servicing and maintenance.

LEARNING CONTENT:

S1106.2 Identify regulations that govern pool and spa/hot tub installations, servicing, and maintenance. (5/0 hrs)

Identify regulations including:

- Building permits
- ESA and Electrical regulations
- TSSA and Gas regulations
- Municipal Fencing
- Municipal Building Codes
- Transportation of Goods Legislation

S1106.3 Identify regulations for working in the pool and spa/hot tub industry. (3/0 hrs)

Identify legislation that impact on both employers and employees working in the pool and spa/hot tub industry including:

- Employment Standards Act
- WSIB
- Ministry of Transportation
  - driving licensing
  - transportation of hazardous good
- Environmental Protocols
- Electrical Safety Authority
- Technical Standards and Safety Authority

S1106.4 Describe factors of risk management. (2/0 hrs)

Describe aspects and features of risk management including:

- loss
- perils
- risk transfer
- risk assessment
- liability
- insurance claims
- APSP standards

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer Level 1 Common Core

Number: **S1107.0**

Reportable Subject: **TRADE CALCULATIONS**

Duration: Total 21 hours Theory 9 hours Practical 12 hours

Prerequisites: Grade 12

Content:

S1107.1 Convert dimensions and quantities between Metric and Imperial. **1/1 hrs**

S1107.2 Develop sketches from linear dimensions. **1/2 hrs**

S1107.3 Calculate perimeters, areas and volumes. **1/1 hrs**

S1107.4 Solve problems using ratios and proportions. **1/2 hrs**

S1107.5 Calculate dimensions using the Pythagorean theorem formulae. **1/1 hrs**

S1107.6 Calculate chemical treatment/adjustments. **1/1 hrs**

S1107.7 Calculate water volumes. **1/1 hrs**

S1107.8 Calculate flow rates and velocities. **1/1 hrs**

S1107.9 Calculate water temperature adjustments. **1/2 hrs**

Evaluation & Testing:
Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
33%	66%	100%

Instructional and Delivery Strategies:
- Lecture
- Classroom workshops
- Video
- Computer Based Training
- E-Learning

Reference Materials:
- Manufacturers' Technical Manuals
- APSP Basic Pool & Spa/Hot Tub Technology 3rd Edition
- APSP Builders Reference Manual

S1107.0 Trade Calculations

Duration: Total 21 hours Theory 9 hours Practical 12 hours

Cross Reference to Training Standards: 237S 1.0 > 8.0; 237T 1.0 > 6.0

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to perform calculations required to install, construct, service or maintain pool or spa/hot tubs.

CURRICULUM OUTCOMES:

S1107.1 Convert dimensions and quantities between Metric (SI) and Imperial. (1/1 hrs)

Demonstrate conversations including:
- linear units
- mass units
- area units
- volume units

S1107.2 Develop sketches from linear dimensions. (1/2 hrs)

Demonstrate sketches from linear dimensions using both:
- Metric (SI)
- Imperial

S1107.3 Calculate perimeters, areas and volumes. (1/1 hrs)

Calculate dimensions of geometric figures including:
- perimeter
- areas
- volumes

Calculate circumference and area of a circle.

Calculate volume of solid figures including:
- cubes
- cylinders
- square prisms

LEARNING CONTENT:

S1107.4 Solve problems using ratios and proportions. (1/2 hrs)

Solve problems using ratios and proportions including:
- linear
- volume
- square prisms

S1107.5 Calculate dimensions using the Pythagorean theorem formulae. (1/1 hrs)

S1107.6 Calculate chemical treatment/adjustments. (1/1 hrs)

Calculate chemical treatments or adjustments using:
- manufacturers' charts
- tables
- formulas
- manufacturers' specifications

S1107.7 Calculate water volumes. (1/1 hrs)

Calculate water volumes including:
- gallons
- liters
- cubic feet

S1107.8 Calculate flow rates and velocities. (1/1 hrs)

Calculate flow rates and velocities including:
- volume
- speed

S1107.9 Calculate water temperature adjustments. (1/2 hrs)

Calculate water temperature adjustments including:
- BTU's
- type of heater
- size of heater

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer — Level 1 Common Core

Number: **S1108.0**

Reportable Subject: **WATER CHEMISTRY**

Duration: Total 30 hours Theory 27 hours Practical 3 hours

Prerequisites: Grade 12

Content:

S1108.1 Identify pertinent safety procedures when working with chemicals for water balancing and sanitation. **2/0 hrs**

S1108.2 Describe elements and features of water balancing. **5/0 hrs**

S1108.3 Describe elements and features of water sanitation. **5/0 hrs**

S1108.4 Describe water chemistry testing procedures. **5/0 hrs**

S1108.5 Identify chemicals used to balance and clean water. **5/0 hrs**

S1108.6 Perform calculations for balancing and sanitizing water. **5/3 hrs**

Evaluation & Testing:
Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
10%	90%	100%

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer

Level 1 Common Core

Instructional and Delivery Strategies:

- Lecture
- Classroom workshops
- Video
- Computer Based Training
- E-Learning

Reference Materials:

- Manufacturers' Technical Manuals
- APSP Basic Pool & Spa/Hot Tub Technology 3rd Edition
- APSP Builders Reference Manual
- WHMIS Handbook
- Occupational Health and Safety Act

S1108.0 Water Chemistry

Duration: Total 30 hours Theory 27 hours Practical 3 hours

Cross Reference to Training Standards:
Service Technician: 2.01-2.10, 3.01-3.10, 4.01-4.08, 5.01-5.10, 6.01-6.11, 7.01-7.09, 8.01-8.09
Installer: 2.01, 2.02, 2.04-2.07, 3.01-3.16, 4.01-4.13, 5.01-5.19, 6.01-6.09

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to identify, describe and demonstrate all elements and procedures for balancing and sanitizing water.

CURRICULUM OUTCOMES:

S1108.1 Identify pertinent safety regulations and procedures when working with chemicals for water balancing and sanitation. (2/0 hrs)

Identify pertinent safety regulations and procedures for:
- personal protective equipment
- environmental protection
- public protection

S1108.2 Describe elements and features of water balancing. (5/0 hrs)

Describe factors affecting water balancing including:
- ph
- total alkalinity
- calcium hardness
- total dissolved solids

Determine water balancing elements using:
- Langlier Saturation Index
  - ph factor
  - alkalinity
  - temperature
  - calcium hardness

LEARNING CONTENT:

S1108.3 Describe elements and features of water sanitation. (5/0 hrs)

Describe possible communicable diseases that can be found in pools and spa/hot tubs including:

- infectious agents
- diseases
- modes of transmission

Describe chlorination applications including:

- chlorine demand
- chlorine application methods
- breakpoint chlorination modes of transmission

Describe disinfecting agents including:

- chlorines
- bromines

S1108.4 Describe water testing procedures. (5/0 hrs)

Describe testing procedures for water balancing including:

- test strips
- titration

Describe chemicals used for sanitizing water including:

- chlorine
- bromines
- O.R.P. – oxidation reduction potential

Describe water testing methods to sanitize the water including:

- test strips
- titration
- DPD tablets
- O.R.P. – oxidation reduction potential
- scanners
- electronic meters

LEARNING CONTENT:

S1108.5 Identify chemicals used to balance and clean water. (5/0 hrs)

Identify chemicals and sanitizers including:

- granular chlorines
- gas chlorines
- bromine

Describe safe handling and storage procedures of pool and spa/hot tub chemicals.

S1108.6 Perform calculations for balancing and sanitizing water. (5/3 hrs)

Calculate required chemical solutions for water balancing including:

- pH balance
- alkalinity
- calcium hardness

Calculate required chemical solutions for water sanitizer including:

- chlorine
- bromine

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer — Level 1 Common Core

Number: **S1109.0**

Reportable Subject: **PLUMBING**

Duration: Total 36 hours Theory 24 hours Practical 12 hours

Prerequisites: Grade 12

Content:

S1109.1	Identify pertinent safety regulations and procedures when performing plumbing installation or maintenance. **1/0 hrs**
S1109.2	Describe functions and operations of circulation components. **3/5 hrs**
S1109.3	Describe functions and operations of pumps and motors. **3/1 hrs**
S1109.4	Describe functions and operations of filtration systems and components. **4/1 hrs**
S1109.5	Describe functions and operations of heating system and components. **3/1 hrs**
S1109.6	Describe functions and operations of water hydraulics. **3/1 hrs**
S1109.7	Describe application and functions of piping and fittings. **4/1 hrs**
S1109.8	Describe leak testing and repair techniques. **3/2 hrs**

Evaluation & Testing:
Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
66%	34%	100%

Instructional and Delivery Strategies:
Lecture
Classroom workshops
Video
Computer Based Training
E-Learning

Reference Materials:
Manufacturers' Technical Manuals
APSP Basic Pool & Spa/Hot Tub Technology 3rd Edition
APSP Builders Reference Manual

S1109.0 Plumbing

Duration: Total 36 hours Theory 24 hours Practical 12 hours

Cross Reference to Training Standards:
Service Technician: 2.03, 2.04, 2.06-2.09; 3.03, 3.04, 3.06-3,09; 4.02-4.07; 5.03-5.09; 8.06-8.08
Installer: 3.04-3.06, 3.09-3.11, 3.16; 4.05, 4.08, 4.10; 5.06, 5.08, 5.12- 5.14, 5.16, 5.17; 6.06, 6.09

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to identify and describe all elements and features of installing, servicing, and maintaining plumbing systems in pools or spa/hot tubs.

CURRICULUM OUTCOMES:

S1109.1 Identify pertinent safety regulations and procedures when performing plumbing installation and maintenance. (1/0 hrs)

Identify pertinent safety regulations and procedures for:
- personal protective equipment
- environmental protection
- public protection

S1109.2 Describe functions and operations of circulation components. (3/5 hrs)

Describe the operation and function of circulation system and components including:
- skimmers
- pipes
- valves
- jets/return fitting
- bottom circulators (main drains)
- drain covers
- suction release systems

LEARNING CONTENT:

S1109.2 (continued)

Describe common problems that occur with circulation systems and components including:

- leakage
- oversized pumps
- entrapment
- entanglement
- undersized plumbing
- blockage

Identify solutions and repair techniques for circulation systems and components including:

- pipe slicing
- fitting replacements
- pipe and fittings
- patching

Identify different types of pipe and fitting including:

- rigid PVC
- flexible PVC
- polypipe
- copper pipe

Describe pipe and fitting installation techniques including

- gluing
- clamping
- taping
- threading
- soldering

Identify required tools and equipment for repair and servicing of the circulation systems including:

- blowers
- fish tape
- wrenches
- sealants
- cutting tools
- compression fittings
- hand tools and power tools

LEARNING CONTENT:

S1109.3 Describe functions and operations of pumps and motors. (3/1 hrs)

Identify the operation and function of pump and motor components including:

- impellers
- seals
- volutes
- diffusers

Describe common problems that can occur with pumps and motors including:

- leaky seals
- damaged volutes and diffuser
- plugged impellor

Identify solutions and methods for servicing or repairing pumps.

Identify solutions and methods for servicing defective motors.

Identify tools and equipment required for installing or repairing pumps including:

- sockets
- buckets
- pliers
- hammers
- wrenches

LEARNING CONTENT:

S1109.4 Describe functions and operations of filtration systems. (4/1 hrs)

Describe the operation and function of filtration system components including:

- filters
- media
- flow controls
- valves

Identify common problems that can occur with filtration systems and components.

Describe solutions and techniques to repair filtration systems and components.

Identify required tools and equipment to repair filtration systems including:

- shop vacuum
- buckets
- sockets
- pliers

LEARNING CONTENT:

S1109.5 Describe functions and operations of heating system. (3/1 hrs)

Identify pertinent legislations and regulations that governing the licensing and training for the installation and servicing of heating systems.

Identify types heating systems including:
- fossil fuel
- electric heaters
- heat pumps
- solar heating

Identify components of heating systems including:
- exchangers
- elements
- panels
- control systems

Describe common problems that can occur with heating system including:
- low water source
- power source
- defective element
- defective wiring
- corrosion

Identify solutions and methods to service or repair the heating system.

Identify required tools and equipment to service or maintain the heating system including:
- multimeter
- measuring devices
- hand tools

LEARNING CONTENT:

S1109.6 Describe functions and operations of water hydraulics. (3/1 hrs)

Describe the operation and function of water hydraulics including:

- pressures
- friction
- resistance

Perform basic water hydraulic calculations including:

- flow rate
- turnover
- velocity

S1109.7 Describe the application and functions of piping and fittings. (4/1 hrs)

Describe the application and function of pipes and fittings including:

- PVC
- polypipe
- flex pipe
- copper

Describe the factors required for efficient piping layouts including:

- elevations
- distances
- manifolding
- friction reduction

LEARNING CONTENT:

S1110.8 Describe leak detection testing and repair techniques. (3/2 hrs)

Describe methods for detecting leaks including:

- dye tests
- pressure testing
- electronic leak detection

Describe repair techniques for piping and circulation systems including:

- pipe splicing
- fitting replacement
- pipe and fitting patching
- patching
- gluing
- solvent welding

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer — Level 1 Common Core

Number: **S1110.0**

Reportable Subject: **POOL AND SPA/HOT TUB STRUCTURES**

Duration: Total 18 hours Theory 15 hours Practical 3 hours

Prerequisites: Grade 12

Content:

S1110.1 Identify standard industrial materials for pools or spa/hot tub structures and components. **3/0 hrs**

S1110.2 Describe types of pool and spa/hot tub shell structures. **3/0 hrs**

S1110.3 Identify types and application techniques of interior finishes. **3/1 hrs**

S1110.4 Identify common structural or surface problems that can occur of pools and spa/hot tubs. **3/1 hrs**

S1110.5 Identify basic repair techniques of structures or surfaces of pools and spa/hot tubs. **3/1 hrs**

Evaluation & Testing:
Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
75%	25%	100%

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer

Level 1 Common Core

Instructional and Delivery Strategies:

- Lecture
- Classroom workshops
- Video
- Computer Based Training
- E-Learning

Reference Materials:

- Manufacturers' Technical Manuals
- APSP Basic Pool & Spa/Hot Tub Technology 3rd Edition
- APSP Builders Reference Manual
- Building Codes

S1110.0 Pool and Spa/Hot Tub Structures

Duration: Total 18 hours Theory 15 hours Practical 3 hours

Cross Reference to Training Standards:
Service Technician: 6.01-6.10 ; 8.06-8.08
Installer: 3.04-3.10; 4.03-4.07; 5.03-5.08, 5.10, 5.12-5.14; 6.04, 6.05

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to describe all features of installing, servicing, and maintaining the structural and surface features of a pool or spa/hot tub.

CURRICULUM OUTCOMES:

S1110.1 Identify standard industrial materials for pool or spa/hot tub structures and components. (3/0 hrs)

Identify common building materials including:
- metals
- concrete
- vinyl
- composites
- aluminum

S1110.2 Describe types of pool and spa/hot tub shell structures. (3/0 hrs)

Describe basic construction and fabrication techniques of concrete pool shells including:
- gunnite
- form-poured
- shot-crete
- hand-packed

Describe basic construction and fabrication techniques of vinyl liner pool shells including:
- in-ground
- above-ground
- steel walls
- composite walls
- various bottom surfaces

LEARNING CONTENT:

S1110.2 (continued)

Describe basic construction and fabrication techniques of spa/hot tubs and hydrotherapy pool shells including:

- acrylic
- fiberglass
- polyethylene
- wood
- steel

S1110.3 Identify types and application techniques of interior finishes. (3/1 hrs)

Identify pool and spa/hot tub interior finishes including:

- paint
- gel coat
- acrylic
- plaster
- tile
- vinyl

LEARNING CONTENT:

S1110.4 Identify common structural or surface problems that can occur with pools and spa/hot tubs. (3/1 hrs)

Identify common structural or surface problems with pools and spa/hot tubs including:

- cracking
- lifting
- flaking
- peeling
- bottom failure
- corrosion
- frost movement
- rotting
- delaminating
- fading
- blistering
- abrasion/cutting
- chemical corrosion
- wrinkling
- rough surfacing

S1110.5 Identify basic repair techniques of structures or surface of pools and spa/hot tubs. (3/1 hrs)

Describe basic repair techniques of structures or surface of pools and spa/hot tubs including:

- vinyl patching
- acrylic repair

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer

Level 1 Common Core

Number: **S1111.0**

Reportable Subject: **ELECTRICAL SYSTEMS**

Duration: Total 24 hours Theory 15 hours Practical 9 hours

Prerequisites: Grade 12

Content:

S1111.1 Identify pertinent legislation and regulations when working with electrical systems. **(1/0 hrs)**

S1111.2 Describe electrical theory and terminology. **(2/0 hrs)**

S1111.3 Perform calculations for electrical systems. **(2/3 hrs)**

S1111.4 Identify basic electrical components and circuits. **(3/0 hrs)**

S1111.5 Interpret basic electrical schematics. **(3/3 hrs)**

S1111.6 Describe functions and operations of electrical motors and components. **(2/0 hrs)**

S1111.7 Demonstrate basic electrical testing procedures. **(2/3 hrs)**

Evaluation & Testing:

Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
70%	30%	100%

Instructional and Delivery Strategies:
Lecture
Classroom workshops
Video
Computer Based Training
E-Learning

Reference Materials:
Manufacturers' Technical Manuals
APSP Basic Pool & Spa/Hot Tub Technology 3rd Edition
APSP Builders Reference Manual
Electrical Safety Authority

S1111.0 Electrical Systems

Duration: Total 24 hours Theory 15 hours Practical 9 hours

Cross Reference to Training Standards:
Service Technician: 6.01-6.10 ; 8.06-8.08
Installer: 3.04-3.10; 4.03-4.07; 5.03-5.08, 5.10, 5.12-5.14; 6.04, 6.05

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to describe all features of installing, servicing, and maintaining the electrical systems in pools or spa/hot tubs.

CURRICULUM OUTCOMES:

S1111.1 Identify pertinent legislations and regulations working with electrical systems. (1/0 hrs)

Identify pertinent legislations and regulations including:
- ESA
- CSA
- OHSA
- Building Codes

Identify safety hazards which can occur when performing any electrical work.

Describe safe working habits including:
- protective gear
- good housekeeping
- start up and shut off procedures
- lock out procedures
- grounding

S1111.2 Describe electrical theory and terminology. (2/0 hrs)

Describe electrical concepts and theories including:
- resistance
- voltage
- amperage

Identify common electrical symbols and terminology on schematics and drawings.

LEARNING CONTENT:

S1111.3 Perform calculations for electrical systems. (2/3 hrs)

Perform calculations using:
- Ohm's law
- Watt's law

S1111.4 Identify basic electrical components and circuits. (3/0 hrs)

Describe functions and operations of common electrical components including:
- wiring
- relays
- switches
- controls

Interpret electrical equipment data plates.

S1111.5 Interpret basic electrical schematics. (3/3 hrs)

Interpret schematic drawings to identify:
- circuit pathways
- component symbols

S1111.6 Describe functions and operations of electrical motors and components. (2/0 hrs)

Identify terminology and principles of electrical motors including:
- rotor
- stator
- information plate

Describe operations and functions of electrical motors.

Describe procedures for the assembly and disassembly of an electrical motor.

LEARNING CONTENT:

S1111.7 Demonstrate basic electrical testing procedures. (2/3 hrs)

Describe procedures and techniques for performing electrical tests.

Describe electrical testing techniques including:
- voltage
- continuity

Identify electrical testing tools and equipment including:
- multimeter
- circuit tester

Demonstrate basic electrical test procedures.

Pool and Spa/Hot Tub Service Technician
Pool and Spa/Hot Tub Installer — Level 1 Common Core

Number: **S1112.0**

Reportable Subject: **GENERAL CONSTRUCTION AND MAINTENANCE METHODS**

Duration: Total 24 hours — Theory 21 hours — Practical 3 hours

Prerequisites: Grade 12

Content:

S1112.1	Identify pertinent legislation and regulations when performing general construction and maintenance work. **1/0 hrs**
S1112.2	Identify types and construction methods of concrete pool and spa/hot tubs. **(2/0 hrs)**
S1112.3	Identify types and construction methods for in-ground and on-ground vinyl pools. **(3/0 hrs)**
S1112.4	Identify types and construction methods for above-ground vinyl pools. **(3/0 hrs)**
S1112.5	Describe functions and operations of maintenance equipment. **(3/1 hrs)**
S1112.6	Describe procedures for performing routine and seasonal maintenance. **(3/2 hrs)**
S1112.7	Describe functions and operations of pool covers. **(2/0 hrs)**
S1112.8	Describe functions and operations of automatic pool cleaning systems. **(2/0 hrs)**
S1112.9	Describe functions and features of decking equipment. **(2/0 hrs)**

Evaluation & Testing:

Assignments related to theory and appropriate application skills
Minimum of one mid-term test during the term
Final exam at end of term
Periodic quizzes

Mark Distribution:

Theory Testing	Practical Application Testing	Module Final Assessment
87%	13%	100%

Instructional and Delivery Strategies:

Lecture
Classroom workshops
Video
Computer Based Training
E-Learning

Reference Materials:

Manufacturers' Technical Manuals
APSP Basic Pool & Spa/Hot Tub Technology 3rd Edition
APSP Builders Reference Manual
ANSI/APSP Swimming Pool Standards

S1112.0 General Construction and Maintenance Methods

Duration: Total 24 hours Theory 21 hours Practical 3 hours

Cross Reference to Training Standards:
Service Technician: 8.02, 8.03, 8.05, 8.06, 8.08
Installer: 2.04, 2.06; 3.02-3.10; 4.02-4.07; 5.02-5.10, 5.12-5.14; 6.02-6.05

GENERAL LEARNING OUTCOME:

Upon successful completion, the apprentice is able to identify and describe general construction and maintenance methods for pools or spa/hot tubs.

CURRICULUM OUTCOMES:

S1112.1 Identify pertinent legislation and regulations when performing general construction and maintenance work. (1/0 hrs)

Identify pertinent legislation and regulations including:
- TSSA
- ESA
- Municipal and Provincial Codes
- Building Codes

Describe pertinent safety legislation including:
- Occupational Health and Safety Act
- Workplace Hazardous Materials Information System
- Transportation of Dangerous Good Regulations
- Workers Safety and Insurance Board

Identify safe working procedures including:
- lifting techniques
- working conditions
- handling of tools and equipment
- excavations
- barricades and guards
- fall rest protection
- safety barriers
- good housekeeping
- protective gear

LEARNING CONTENT:

S1112.2 Identify types and construction methods for concrete pool and spa/hot tubs. (2/0 hrs)

Describe construction techniques for concrete structures including:

- stonework
- drains
- groundwater control
- electrical bonding
- plumbing
- fixtures
- concrete finishing
- tiles
- coping

Describe different surface finishes including

- plaster
- tile
- coping
- paint

Identify types of coping forms used in the construction of concrete pools and hot tubs.

LEARNING CONTENT:

S1112.3 Identify types and construction methods for in-ground and on-ground vinyl pools. (3/0 hrs)

Describe techniques for the construction and installation of in-ground and on-ground vinyl pools including:

- drainage
- stonework
- groundwater control methods
- wall panels
- supporting structures
- walk-in stairs
- plumbing
- bottom materials and finishes
- backfill

Identify types of finishing processes including:

- coping
- liner retainers
- surface preparation
- liner installation

S1112.4 Identify types and construction methods for above-ground vinyl pools. (3/0 hrs)

Describe techniques for the construction and installation of above ground vinyl pools including:

- bottom finish
- liner retainer
- liner installation
- assembly of top rails
- top assembly

S1112.5 Describe functions and operations of maintenance equipment. (3/1 hrs)

Describe common maintenance equipment including:

- manual cleaning equipment
- water test kits
- safety equipment

LEARNING CONTENT:

S1112.6 Describe procedures for performing routine and seasonal maintenance. (3/2 hrs)

Describe routine maintenance processes including
- vacuuming
- surface care - deck and pool
- cleaning debris

Describe maintenance checklists which include:
- care and upkeep
- scheduling
- preventive maintenance
- record keeping
- warranty information

Describe pool and spa/hot tub opening and closing procedures including:
- water chemistry
- circulation equipment
- deck equipment
- covers

S1112.7 Describe functions and operations of pool covers. (2/0 hrs)

Identify types of pool covers including:
- pool safety covers
- automatic covers
- fitter covers
- overlap covers
- solar covers
- spa/hot tub thermal covers
- insulating covers
- roll-up covers

Describe features and properties of various types of covers including:
- applications
- materials
- storage
- care and maintenance

LEARNING CONTENT:

S1112.8 Describe functions and operations of automatic pool cleaning systems. (2/0 hrs)

Describe features and functions of various types of cleaning systems including:

- pressure cleaners
- suction cleaners
- robotic cleaners

S1112.9 Describe functions and features of decking equipment. (2/0 hrs)

Describe installation and maintenance of deck equipment including:

- steps
- slides
- diving boards

Glossary of Terms

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CAC	Curriculum Advisory Committee
CEC	Canadian Electrical Code
CSA	Canadian Standards Association
ESA	Electrical Safety Authority (Ontario)
NSF	National Sanitation Foundation
APSP	National Spa & Pool Institute
OBC	Ontario Building Code
OHSA	Occupational Health and Safety Act
TDG	Transportation of Dangerous Goods
TSSA	Technical Standards and Safety Authority
WHMIS	Workplace Hazardous Materials Information System
WSIB	Workplace Safety and Insurance Board